

Peripheral Intravenous Catheter Duration

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PICOT Question

In adult patients, what is the effect of changing peripheral intravenous catheter sites every 96 hours on reducing the instance of phlebitis, infiltration, and/or occlusion compared with leaving a peripheral intravenous catheter in place for 7 days during an inpatient stay?

Introduction

In an inpatient setting, the placement of peripheral intravenous catheters is one of the more routine invasive procedures that nurses perform. Maintaining intravenous access in an inpatient setting is essential for the timely administration of medication and fluids in both emergent and non-emergent care for patients. With intravenous access being one of the most invasive procedures that nurses perform, it is important to make infection prevention a priority in intravenous site management and care. In this paper I am going to explore the instances of phlebitis, infiltration, and occlusion and how a shorter duration of a peripheral intravenous catheter compared to a current standard of duration at a local hospital can affect the instances of these common complications occurring during an inpatient stay. This topic is important to nurses because improper care of intravenous access can not only put our patients at an increased risk of infection, but it can also prevent us from being able to administer care in a timely and effective manner.

Research Process

I was able to access thousands of articles for information using the University's library search resource. Taking the time to narrow down my inclusion criteria was important as the studies that examined peripheral intravenous catheters used a wide variety of influencing factors for comparison. In regard to the inclusion criteria, I tried to focus on articles that spoke to not

only to the recommended duration of a peripheral intravenous catheter site but also on articles that discussed the various factors that can contribute to the failure of an intravenous catheter site. The inclusion criteria helped in selecting eligible criteria for the research which was used to help rule in or out specific articles that matched the target intervention of reducing the duration of a peripheral intravenous catheter. By selecting specific key terms, and defining the inclusion criteria during the research process, this allowed for the selection of the most applicable and credible articles that are most relevant to this study.

Summary of Sources

There is an existing plethora of research and evidence behind the use of peripheral intravenous catheters. The first article I came across that fit my inclusion criteria was an article from the Journal of Infusion Nursing titled “Accepted but Unacceptable: Peripheral IV Catheter Failure”. This article acts as a sort of meta-analysis of Peripheral IV Catheter use as a whole and utilizes an expansive 162 references itself. The article starts off by commenting on the history of intravenous catheter use and notes how the intended dwell time is traditionally 72 to 96 hours (Helm, Klausner, Klemperer, Flint, & Huang, 2019). The article then takes an in-depth look at the factors of peripheral intravenous catheter failure and associated factors starting with cost. The article states that the average cost for the initiation of a peripheral intravenous site on the first attempt is between \$28 and \$35 dollars (Helm, Klausner, Klemperer, Flint, & Huang, 2019). The costs can fluctuate depending on materials used such as dressing, securement devices, etc. One of the strongest points made in this section is how “venous depletion resulting from repeated failed catheters is an increasingly recognized entity and leads to the need for placement of more invasive, risky, and costly venous access devices” (Helm, Klausner, Klemperer, Flint, & Huang,

2019). I felt this statement was supportive of my overall hypothesized intervention of rotating sites more frequently as this would allow for veins to have a period of rest rather than continuously running fluids and caustic medication and prevent said depletion. The article continues to provide support for this concept as it begins to discuss catheter-related bloodstream infections, a possible result of peripheral intravenous catheter failure. The article estimates that a single case of catheter-related bloodstream infections can result in a 7 to 20 day hospital stay and add up to \$56,000 in expenses (Helm, Klausner, Klemperer, Flint, & Huang, 2019). The article also addresses that while there is a significant amount of information from a medical and scientific perspective on peripheral intravenous catheters, there is a lack of patient prospective data and literature. The article then moves on into discussing perhaps the most pertinent information for my hypothesis, peripheral intravenous catheter dwell time. According to this article, the median peripheral intravenous catheter dwell time is 84 hours (Helm, Klausner, Klemperer, Flint, & Huang, 2019). The article also states that “only 10% to 25% of catheters were able to stay in for more than 5 days; only 3% continued to function adequately after 7 days” (Helm, Klausner, Klemperer, Flint, & Huang, 2019). Furthermore, the article cites a different study which showed that “51% experienced complication necessitating catheter removal by 96 hours” (Helm, Klausner, Klemperer, Flint, & Huang, 2019). The article then goes on to discuss various modes of peripheral intravenous catheter failure which includes but is not limited to phlebitis, infiltration, and occlusion. The article cited the wide variability in instance rates of phlebitis and noted that “even the most rigorously performed prospective randomized trials, applying standardized phlebitis scales, record mean phlebitis rates between 14.7% and 16.1% across studies” (Helm, Klausner, Klemperer, Flint, & Huang, 2019). The article goes into the various types and causes of phlebitis and then move on to discuss infiltration. The article states

that there is a mean incidence of 23.9% of infiltration, making it the most common form of peripheral intravenous catheter failure (Helm, Klausner, Klemperer, Flint, & Huang, 2019). The article also mentions mechanical occlusion and makes note of the various factors that can cause an occlusion as well as the fact that there is a mean instance rate of 18.8% (Helm, Klausner, Klemperer, Flint, & Huang, 2019).

With plenty of support from this first article, I decided to begin evaluating another resource. The second article that I utilized was an article titled “Insertion and removal of PIVCs: Exploring best practices” that was published in the Journal for Infusion Nursing. While this article was less focused on duration and factors associated with failure, it did focus on current practices and how there exist a lot of standards within healthcare that are not necessarily supported with scientific evidence. For example, in this study 52% of peripheral intravenous catheters were inserted into the antecubital fossa despite the fact that it was discouraged by organizational policy and procedure along with the fact that “use of the cephalic vein, for example, is associated with mechanical phlebitis and general discomfort due to its proximity to a joint” (Fowler, Penoyer, & Bourgault, 2018). This article addresses the fact that many nurses leave an intravenous catheter on stable patients in place until discharge even when fluids and medications are not being used “because ‘what if’ the patient needs an I.V. medication or fluids” (Fowler, Penoyer, & Bourgault, 2018). The article as a whole challenges nurses to take a closer look at their own current policies to examine if they are following tradition or evidence-based practices.

The third article that met my inclusion criteria is titled “A collaborative approach: seeking excellence in vascular access” and was published in the British Journal of Nursing. This article focuses on catheter-related blood stream infections and the importance of proper care and

maintenance for vascular access devices such as peripheral intravenous catheters. One of the most impactful portions of this article is the set of 16 standards used for benchmarking of vascular access practice. The seventh standard in this list clearly states “A peripheral cannula should be removed every 72–96 hours or sooner if complications are suspected and re-sited if still required” (Coram, 2015). This article also recommends that policies be reviewed on an annual basis to be kept up to date with best practices.

The fourth article that met my inclusion criteria is titled “Incidence of phlebitis associated with the use of peripheral IV catheter and following catheter removal” and was published in *Revista Latino-Americana de Engermagem*. I was pleased to have found yet another article that was able to add an international practice perspective to my research. As the title of this article implies, the focus of this study was specifically on phlebitis as the peripheral intravenous complication. By focusing in on one of the most common complications, the study was able to include more detailed factors involved such as the classes of drugs that patients in the study were receiving, the size of catheter used, the location of the peripheral intravenous catheter, and duration of the catheter. According to the study data, the three factors that showed the highest instances of phlebitis was when the catheter as in place for over 72 hours, when the catheter gauge was either 24 or 22, and when antibiotics were being administered through the catheter (Urbanetto, Peixoto, & May, 2016). The article specifically found that the average duration of catheters was 3 days and that “of the 167 catheters remaining for more than 72 hours, 24 patients (14.4%) showed the signs and symptoms of phlebitis” (Urbanetto, Peixoto, & May, 2016).

The fifth article that met my inclusion criteria is titled “Phlebitis-related peripheral venous catheterization and the associated risk factors” and continued to expand upon the international practice perspective as it was published in the *Nigerian Journal of Clinical Practice*.

This study was similar to the study done in the fourth article in that it focused on just one of the common complications of peripheral intravenous catheters. This article makes notes about the variability in current duration practices on the international level, with a range of anywhere from 48 to 144 hours, but also shows with the study data that “There were statistically significant differences between groups in comparison of stay time of PIC in the vein with the rate of incidence for phlebitis” (Atay, Şen, & Çukurlu, 2018). The study also found a correlation between the instances of phlebitis with the type of fluid being administered and in patients who had at least one chronic disease.

The sixth and final article that met my inclusion criteria is titled “Phlebitis risk varies by peripheral venous catheter site and increases after 96 hours: a large multi-centre prospective study” and was published in the *Journal of Advanced Nursing*. This study, like the previous two articles, also focused in on the complication of phlebitis specifically. However, this study also focused in on the influencing factors of catheter site and catheter duration. The article makes a point to highlight the current debate as to whether duration can be extended beyond 96 hours. The study found that “The average time for catheters in situ was 65.6 hours, a relatively lengthy period considering that many patients had their cannulae removed due to phlebitis or no longer requiring them” (Cicolini et al., 2014). One of the study’s most applicable findings to my research was that “the odds of having a recorded phlebitis episode increased on average by 5% with every 24 hour increment of catheter time in situ” (Cicolini et al., 2014).

Critical Appraisal

In evaluating my sources, I determined that I had primarily obtained quantitative studies.

For these quantitative studies, I was able to identify that the purpose of the studies was to examine and evaluate the current standards and practices of using a peripheral intravenous catheter. The quantitative studies clearly detailed their inclusion and exclusion criteria, what their sample size was, how their sample size was obtained, and the methods used to collect the data while accounting for all variables in their studies. The information that was obtained during these studies included variables that were pertinent to account for including location of the catheter, time in situ, and other influencing factors. The quantitative studies that I came across in my research were found to be credible, clinically applicable, and relevant.

While the studies were all quantitative in nature, I felt it was important to note the qualitative aspect each of them also possessed. For all of the studies I was able to determine that they were seeking to understand what the root cause of these common peripheral intravenous catheter complications were and how to best improve practices to prevent them from occurring.

Strengths and Weaknesses

Since I have deemed these articles worthy of inclusion in our research, it is important to evaluate the strengths and weaknesses in each. The article by Helm, Klausner, Klemperer, Flint, & Huang (2019) was perhaps one of the strongest articles as it related to my specific research question. This article provides a solid foundation of background knowledge about peripheral intravenous catheters and the many aspects that contribute to proper care and management. Additionally, the article explains the various known complications and factors that can contribute to these complications occurring. The article has a 2015 copyright on it but it was included in the May/June 2019 issue of the Journal of Infusion Nursing so I believe it could still be considered recent and applicable having been published in the last 3 years. The only area I

would have liked to see more information on in this article would have been the inclusion of fluid types and medication when considering the factors that can affect vascular integrity.

The article by Fowler, Penoyer, & Bourgault (2018) is perhaps one of the weaker articles that I included in my research, but I felt it was still an important contribution to demonstrate the background of current practices in the healthcare field. It was published in 2018 which means it is still considered current information as it was published in the last 3 years. Its weakness was that focused primarily on the practices of the nurses and not the other influencing factors.

The article by Coram (2015) presents many strengths by presenting a detailed review of standards from an international perspective. Additionally, this article provides information as to some of the factors during catheter insertion that are not examined in other studies. Its weakness includes being published in 2015 making the data and information 6 years old and could be considered outdated.

The article by Urbanetto, Peixoto, & May (2016) also gives an international perspective on the concerns around peripheral intravenous catheter practices. The article is strong in that it gives a thorough analysis of all factors contributing to phlebitis, including the different classes of medications that were given during the study. Its weakness is that it was published in 2016 which puts the article on the edge of being outdated at 5 years old.

The article by Atay, Şen, & Çukurlu (2018) continues to contribute to the international practices perspective previously established by the last two articles. The article's strength is that it does an excellent job in addressing the conflicting research in the scientific community regarding the correlation between catheter duration and instances of phlebitis. This shows the authors commitment to presenting unbiased information alongside their study's results. It was published in 2018 which means it is still considered current information as it was published in

the last 3 years. Its weakness is while the study identifies other factors that showed a correlation with phlebitis, it did not go into detail as to the specifics of those factors. For example, the study mentions that chronic illnesses had a correlation with phlebitis but did not include which specific disease processes these participants had.

Finally, the article by Cicolini et al. (2014) is a strong source because it is specifically accounting for the duration of peripheral venous catheters. It is also a strong study in that they identified the rate of increase of instance with phlebitis with the different factors they were taking into account for this study. However, its weakness is that the article was published in 2014 making the data 7 years old and could be considered outdated.

Gaps in body of evidence

I would say that the biggest gap in evidence is the lack of studies with the focus on the other two primary complications I included in my research of infiltration and occlusion. I believe that the reason for this gap in the body of evidence is likely due to the fact that of the three complications of peripheral intravenous catheters I included, phlebitis is the most noticeable and therefore the most easily documented. Phlebitis is also the complication with the most defined grading criteria for assessments of the three complications I included. Speaking from my own personal experience in an inpatient setting, nurses would often notice the phlebitis first and then upon closer examination of the site realize that there was infiltration that had also occurred or remove the catheter to find that it had become bent and therefore occluded.

Clinical Practice Recommendations

While there is significant evidence to support the rotating of sites before 96 hours, there are realistic barriers and considerations that must be accounted for. The first is patient preference. It is no secret that patients do not enjoy getting intravenous catheters. However, in an inpatient setting this is a standard practice and something that patients typically know to expect. While more frequent intravenous catheter placements may not be the first choice of most patients, when presented with the alternative of an increased risk of infection or the potential worsening of symptoms from the delay in medication administration I believe that most patients would be understanding and supportive of intravenous catheter site rotation. Another barrier to be considered is the increase in cost of supplies with rotating sites more frequently. While this would be an unavoidable cost, the decrease in intravenous catheter complications would improve patient outcomes and could potentially reduce their duration of stay. The cost of changing sites would be an investment in our patient's well-being.

While I can understand a facility's hesitancy to update a policy to rotating sites every 96 hours, I think a reasonable solution to improve peripheral intravenous catheter practices would be to discontinue a catheter that has not had any intravenous fluid therapy or medication administered through it after 72 to 96 hours. This allows patients to not have intravenous access longer than is necessary, reducing their risk for complications or infection, while not incurring a significant increase in cost of supplies for the facility.

Conclusion

While guidelines have been updated to allow for a peripheral intravenous catheter to remain in place beyond 96 hours, the focus should be on whether we should leave a catheter in longer than is necessary. The medical field has a long-standing practice of not wanting to discontinue a peripheral intravenous site "just in case", even when it is no longer medically

necessary for the patient. By leaving a peripheral intravenous catheter in place for longer than 96 hours, we are potentially placing patients at an increased risk for painful complications like phlebitis and infiltration. If policy were to be updated to either rotating sites every 96 hours or even simply discontinuing peripheral intravenous catheters no longer in use after 96 hours, this would decrease patients' risk for infection, improve the longevity of patients' vascular integrity, and would also provide nurses with an increased opportunity to keep their intravenous access skills current. There are some minor but realistic barriers that could arise in trying to implement this change, such as a slight increase in cost of supplies and mild discomfort to the patient by rotating sites. However, the time and money that could be saved by preventing peripheral intravenous catheter complications would far outweigh the costs of updating this policy.

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